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Before the
Federal Communications Commission
Washington, D.C. 20554

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| In the matter of The Development of |) | |
| Operational, Technical and Spectrum |) | |
| Requirements For Meeting Federal, State |) | WT Docket No. 96-86 |
| and Local Public Safety Agency |) | |
| Communications Requirements Through the |) | |
| Year 2010 Establishment of Rules and |) | |
| Requirements For Priority Access Service |) | |

**REPLY COMMENTS ON THE SECOND NOTICE OF PROPOSED
RULEMAKING SUBMITTED BY
THE ASSOCIATION FOR MAXIMUM SERVICE TELEVISION, INC.
AND THE NATIONAL ASSOCIATION OF BROADCASTERS**

The Association for Maximum Service Television, Inc. ("MSTV") and the National Association of Broadcasters ("NAB") hereby submit these reply comments on the Commission's Second Notice of Proposed Rulemaking in the above-captioned docket (adopted Oct. 9, 1997, rel. Oct. 24, 1997) (the "Notice").

**I. THE COMMISSION SHOULD RETAIN EXISTING TELEVISION/
LAND MOBILE INTERFERENCE PROTECTION STANDARDS.**

Public safety and land mobile service commenters asked the Commission to substantially lower the existing interference protection standards between analog broadcast television and land mobile services. In fact, these commenters advocate a standard for co-channel interference that is far below even the already-reduced standard (40 dB D/U) proposed in the Notice, and urge reduced adjacent channel protection as well.^{1/} The data do not justify any relaxation of the standards, let alone the drastic reduction proposed. To the

^{1/} See, e.g., Comments submitted by Ericsson, Inc., WT Docket No. 96-86 (Dec. 23, 1997) at 24-25; Comments of Motorola, Inc., WT Docket No. 96-86 (Dec. 24, 1997) at 21-22.

contrary, the extensive record already compiled on land mobile/broadcast interference and NTSC susceptibility^{2/} contradicts the contention of the commenters that interference protection standards can be lowered without substantial harm. A lower standard would lead to a harmful loss of free over-the-air television service at a time when analog television service will continue to be the mainstay of television viewers. The Commission should reject these proposals to lower interference protection standards and, instead, apply to the 746-806 MHz band the land mobile/broadcast protection criteria that are now in place for the 470-512 MHz band as an absolute minimum.^{3/}

A. Protection Standards Must Prevent Any Loss Of Service.

The Commission itself, in 1985, recognized that further relaxing the protection criteria between land mobile and analog television service would cause a loss of television service.^{4/} Further, studies show a decreasing tolerance of interference on the part of viewers (discussed in Part B below) which makes any relaxation in the interference protection standards even more worrisome.

Lowering the current interference protection standard will result in a loss the public's television service -- a result that plainly contradicts congressional intent and

^{2/} Results of RF Mask Test, Advanced Television Technology Center Report (June 13, 1996) ("ATTC Report").

^{3/} Id. (indicating that NTSC service requires additional protection from narrow-band signals).

^{4/} See Further Sharing of the UHF Television Band by Private Land Mobile Radio Services, 101 FCC 2d 852, 861 (1985) ("Further Sharing"); Engineering Statement on Behalf of Maximum Service Telecasters, Inc. in Support of Reply Comments in Gen. Docket No. 85-172 by Jules Cohen & Assoc. (Aug. 29, 1986) ("Cohen Report") (attached as an Appendix).

Commission policy. Some commenters^{5/} suggest lowering the level to "reasonable" protection of television viewers; one states that only "economically significant" interference should be guarded against.^{6/} These interference acceptance criteria are undefined and highly controversial. More importantly, Congress (in the Balanced Budget Act of 1997) directed the Commission to brook no additional interference to television services. The "no" was not qualified in any of the ways the land mobile commenters suggest that it should be. Congress plainly directed the Commission to "establish any additional technical restrictions [on public safety use] necessary to protect full-service analog television service and digital television service during a transition to digital television service."^{7/}

The Commission itself has indicated that "all existing analog and DTV full service broadcast operations on channels 60-69 will be fully protected during the transition."^{8/} Full protection should mean no loss of free over-the-air television service and the creation of an environment in which broadcasters may continue to serve their viewers to the full extent of their authorized facilities.

^{5/} See, e.g., Ericsson at 22; Motorola at 19.

^{6/} See Ericsson at 22.

^{7/} Balanced Budget Act of 1997, P.L. No. 105-33 at § 3004 (codified at 47 U.S.C. § 337(d)(2)).

^{8/} Notice at ¶ 6 (emphasis added) citing Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service, Sixth Report and Order, MM Docket No. 87-268 (rel. April 21, 1997) at ¶ 80; Fifth Report and Order, MM Docket No. 97-268 (rel April 21, 1997) at ¶¶ 99-100 (the "DTV Fifth Report and Order").

B. The Protection Standard Should Be Based on General, Not Exceptional, Conditions.

In proposing a 40 dB standard for co-channel protection generally in the 746-806 MHz band, the Notice seeks to write large a narrow exception to the general protection criteria now in use. The 40 dB standard has been used only in limited and extraordinary situations involving one channel in three cities (New York, Cleveland and Detroit). The Commission has indicated that the 40 dB standard was based on "particular circumstances."^{9/} In New York City and Cleveland, unusual terrain features in the direction of the co-channel protected television stations provided additional protection to television co-channel viewers from land mobile.^{10/} In Detroit, the predicted Grade B contour of the co-channel facility needing protection was smaller than the benchmarks set in Docket 18261.^{11/} These circumstances do not exist generally across the country and should not be the basis for a generally applicable rule. By the same token, any proposal to reduce the protection standard even further below 40 dB should be rejected.

C. The Technical Basis For Reducing the Protection Standard Is Flawed.

The technical reasons cited by some commenters in support of a lower standard are unsubstantiated by technical evidence and contradicted by ample evidence in the record. While many commenters simply assert without any supporting evidence that a lower

^{9/} Further Sharing at 858.

^{10/} Id. at n.19.

^{11/} Id.

protection standard should be set, others^{12/} have pointed to the following factors to justify their arguments: (1) modern television receivers exhibit better interference immunity; (2) frequencies in the 746-806 MHz band exhibit greater propagation path loss than those in the 470-512 MHz band, and (3) the front-to-back ratio of television receiving antennas provide at least 15 dB protection from land mobile transmission.^{13/} These claims are contradicted by laboratory study^{14/} and field experience.

First, current receiver technology does not support a reduction in the protection criteria. A receiver has no mechanism by which to reject an undesired signal on the same channel. Thus, technology does not exist in television receivers that could improve the filtration of co-channel interference. Moreover, testing conducted by the Commission since the land mobile/broadcast protection criteria were established in General Docket 18261 shows that receivers are no better today at rejecting adjacent channel and taboo interference than they were when the standards were established.^{15/} An additional factor to bear in

^{12/} See, e.g., Motorola at 20-21; Comments submitted by the National Public Safety Telecommunications Council ("NPSTC"), WT Docket No. 96-86 (Dec. 24, 1997) at 48-49; Ericsson at 23-24.

^{13/} See Motorola Appendix at 30; Ericsson at 22.

^{14/} See generally ATTC Report.

^{15/} Compare Interference to TV by Other Services (1968, 1968) (cited in Further Sharing at n.23) with Receiver Susceptibility Measurements Relating to Interference Between UHF-TV and Land Mobile Radio Services, Daniel J. Stanks, Office of Engineering and Technology, Federal Communications Commission (1986).

mind is that viewer tolerance of interference has diminished over the last thirty years so that the same co-channel interference is now experienced as worse.^{16/}

Second, the Commission has already examined whether different propagation models should be applied to the lower and upper ends of the 470-806 MHz spectrum. In its Further Sharing proceeding, the Commission proposed allocating channels in the lower UHF and higher UHF range to land mobile, and it applied the same FCC propagation curves (R-6602) to predict interference at both ends of that spectrum.^{17/} These propagation curves have been used extensively by the Commission to predict both the broadcast and land mobile services in UHF frequencies. Specifically, these propagation curves were used to predict service and interference for the land mobile services operating in the 800 and 900 MHz bands. Given the Commission's conclusion that the same propagation model should apply throughout the 470-806 MHz band, and the absence of any new evidence to the contrary, choosing now to use different propagation curves on the upper portion of the spectrum would be unprincipled.

Third, commenters urging a relaxation of the interference criteria to account for front-to-back receiving antennas are largely double counting for antenna discrimination because the Commission's existing criteria already take this factor into consideration.^{18/}

The Further Sharing proceeding took into account an average television receiving

^{16/} See B. Jones, Subjective Assessment of Protection Ratios for UHF Broadcast Signals, Report 4/86, CBS Technology Center (Apr. 23, 1986); DTV Advisory Committee Report: ATEL Report on Subjective Assessment of NTSC Signals Under Co-channel and Noise Conditions (April 1994).

^{17/} See Further Sharing at 860-61 (not differentiating between these portions of the spectrum).

^{18/} Ericsson acknowledges that the assumption regarding full front-to-back ratio is not a basis to relax adjacent channel standards. Ericsson at 25.

discrimination of 10 dB after considering claims that an even larger adjustment should be made.^{19/} Moreover, the Commission acknowledged that even the adjustment of the standard by 10 dB on the basis of antenna characteristics would lead to significant loss of service.^{20/} Thus, not only has this factor already been counted, but the standard of protection for the present proceeding already permits the destruction of service and a further reduction would lead to even more service losses.

In short, protection against interference from land mobile should not be relaxed. Reduced protection would destroy service for many viewers and degrade it for numerous others. Viewers are more sensitive to interference now than they were when the broadcast/land mobile protection standards were established. There is insufficient evidence to support a relaxation of the standard and there is convincing evidence in the record to support retention of the modest standards that currently apply.

II. STANDARDS FOR PROTECTING THE PUBLIC'S TELEVISION SERVICE MUST BE BASED ON SCIENTIFIC DATA.

The Commission should gather and analyze appropriate data before it establishes protection criteria for the public's DTV service. While some commenting parties argue that the protection level for DTV should be lower than it is for analog television,^{21/} no commenter provided data or recommended how the Commission should determine a standard for DTV/land mobile interference protection. It is possible that protection criteria

^{19/} Id. at 860-61.

^{20/} Id. at 861. Cohen Report at 25-26.

^{21/} See, e.g., Ericsson at 25; Motorola at Appendix p. 33; NPSTC at 50.

for DTV could be lower than that required for analog television, but there is simply no data at this time to permit the Commission to establish a reliable standard.

The risk to both broadcasters and the public safety/land mobile community of an improper standard is high. An under-protective standard would cause loss of the public's DTV service. As we have noted, excessive interference to digital transmission would cause a total loss of sound and picture, not just fuzzy reception at the edges. Likewise, an overly protective standard would waste spectrum in a band where the cost of under-utilized spectrum is high. Taking the time to investigate the nature of land mobile interference to digital television on the basis of real world experience would be a wise precaution and is probably required under the Administrative Procedures Act. The Commission should form a committee composed of all interested parties to oversee scientific testing. The mandate of the committee should ensure that the work is based on commonly accepted scientific principles. Because the data could be gathered and analyzed quickly, the process need not delay use of this spectrum by new services.

We also urge the Commission to ensure that protection standards for DTV service allow for full build-out of DTV facilities. The Commission should reject the proposal that protection standards for DTV should be limited to the actual power and height of stations as initially constructed rather than the facilities permitted under the rules. Constricting the ability of DTV broadcasters to increase their service could stunt the full reach of DTV and cause viewer disenfranchisement later on in the process. In many cases it will be in the public interest for stations to launch DTV service as quickly as possible but with less than full facilities and then to build out to fully-authorized capacity later. In

addition, actual field experience may require adjustments to the power levels used in propagating a digital signal. Limiting DTV power to the levels at which stations first begin to broadcast is contrary to the DTV rules, which provide for full protection of the predicted DTV contours. Such a limitation would effectively rewrite the DTV service rules and create new limitations on DTV service -- subjects that are not within the scope of this proceeding.

III. EXTENSIONS

Some commenters^{22/} urged the Commission not to grant extensions of time for DTV build-out on channels 60-69. The Commission has resolved this issue in the DTV proceeding, where it spelled out the criteria for granting extensions of time.^{23/} As the Commission repeatedly has recognized, there are enormous uncertainties involved in the transition to digital television and broadcasters must have enough flexibility to respond to constraints beyond their control such as zoning, Federal Aviation Administration requirements, equipment availability and other issues. In any case, this proceeding is not the proper place to address DTV build-out deadlines.

IV. PUBLIC SAFETY SERVICE DEFINITION

We agree with law enforcement organizations that the Commission should define public safety as traditional public safety entities -- law enforcement, fire fighters, and emergency rescue services. Given the scarcity of the spectrum, the Commission should reject a broad definition that would put public safety users in competition with entities that are not key to public safety efforts. The Commission has a difficult task in ensuring that the

^{22/} See, e.g., Comments of the Major Cities Police Chiefs Association at 4 (WT Docket No. 96-86 (Dec. 22, 1997)).

^{23/} DTV Fifth Report and Order, ¶¶ 97-100.

users Congress has assigned to share this spectrum do not interfere with each other. This task should not be made even more difficult by adding marginal users to this spectrum.

V. CHANNEL SPACING

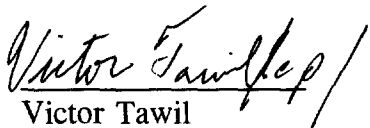
We reiterate our view that the Commission should implement incentives to encourage a 6.25 kHz channel size for voice and data on the 746-806 MHz band. Experience demonstrates that channel size may be reduced without affecting the quality of voice or data transmissions. Narrower channels would permit wider variety of uses of the spectrum for public safety and minimize potential conflicts with other users of the spectrum. Further, incentives for narrower channels, which are dictated by good spectrum management policy, would reduce the need for Congress and the Commission to find additional spectrum for new public safety uses. Absent incentives, public safety could use this spectrum inefficiently and create pressures for additional spectrum to be allocated, unnecessarily, for these purposes.

* * *

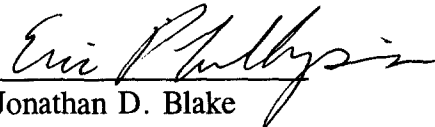
For the foregoing reasons, MSTV and NAB urge the Commission to retain the 50 dB protection standard for land mobile/analog broadcast services; to abstain from establishing land mobile - DTV protection criteria until there is more data to provide a rational basis for such criteria; to avoid settling issues in this proceeding (such as revising DTV build-out deadlines) that are better handled in the DTV proceeding; and to provide incentives to public safety entities to use 6.25 kHz channels for voice and data.

Respectfully submitted

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January 26, 1998

APPENDIX

JULES COHEN & ASSOCIATES, P.C.
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ENGINEERING STATEMENT
ON BEHALF OF
ASSOCIATION OF MAXIMUM SERVICE TELECASTERS, INC.
IN SUPPORT OF REPLY COMMENTS
IN THE MATTER OF
FURTHER SHARING OF THE UHF TELEVISION BAND
BY PRIVATE LAND MOBILE RADIO SERVICES
GENERAL DOCKET NUMBER 85-172

Jules Cohen, being first duly sworn, says that he is president of Jules Cohen & Associates, P.C., consulting electronics engineers with offices in Washington, D.C.; that he is a professional engineer registered in the District of Columbia and Commonwealth of Virginia; and that his qualifications as an engineering expert are well known to the Federal Communications Commission. This engineering statement, prepared on behalf of the Association of Maximum Service Telecasters, Inc. (MST), is in support of Reply Comments in the Matter of Further Sharing of the UHF Television Band by Private Land Mobile Radio Services (General Docket Number 85-172). The statement is directed principally to the comments of the Land Mobile Communications Council (LMCC), Motorola, Inc. (Motorola), and National Association of Business and Educational Radio, Inc. (NABER). The areas addressed are receiver susceptibility to interference, the tests at the CBS Technology Center, adjustment factors to relate "just perceptible" interference in a 50 IRE flat gray field to an "acceptable" level of interference in program content, TV receiving antenna discrimination, and existing sharing of UHF television channels by land mobile.

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Susceptibility of Television Receivers to
Land Mobile Interference

LMCC recommends a 35 dB desired-to-undesired (D/U) ratio for cochannel protection (page A-7) and considers a 45 dB cochannel median ratio as conservative (paragraph 16). The claim is alleged to be supported by tests by the Canadian Department of Communications (DOC), Carl T. Jones Corporation (CTJC), and the Federal Communications Commission (FCC). Motorola alleges that its support for a D/U ratio of 40 dB or less is found in the work of the Television Allocations Study Organization (TASO) in the early 60s (the TASO work was actually conducted in the 50s), an FCC study completed in '73, a Canadian DOC report from '76, and the CTJC work in '86 (A3-1). NABER claims that a cochannel receiver susceptibility factor of 43 dB is supported by the FCC work and 40 dB supported by the DOC (page 7).

These land mobile interests seek to rely on tests conducted ten and more years ago, tests that are of little value for judging the susceptibility of modern television receivers to interference. Such tests would be heavily weighted toward the mechanical tuning devices which prevailed at that time. On the contrary, current receivers are dominantly of the electronically tuned type. The Electronic Industries Association (EIA) reported that in 1985 over three-fourths of all color television receivers sold to dealers were electronically tuned (EIA Comments, footnote 22). Unlike mechanical

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tuning, electronic tuning requires preamplification before detection. The result is increased sensitivity to interference of certain types. Reliance must, instead, be placed upon more recent tests using a representative sample of modern receivers. For this reason, MST recommendations are based on test results reported by the FCC in 1985, by the National Association of Broadcasters (NAB), and CTJC in 1985 and 1986.

As indicated in the Engineering Statement supporting MST's July 11, 1986, Comments, these test results do not support the land mobile recommendations. Despite claims that the broadcaster recommendations were based on a single receiver (LMCC A-5), the FCC tests used 27 receivers and showed "just perceptible" interference at a D/U ratio of 65 dB for the median receiver and 68 dB for the 90th percentile receiver for interfering frequencies near the visual carrier. The tests were based upon interference from a single interferor when the television receiver display was a 50 IRE flat gray field. In the FCC tests, the receiver most sensitive to interference required a D/U ratio of 72 dB. Similar tests conducted at CTJC and NAB on seven contemporary receivers showed the median receiver as requiring a D/U ratio of 66 dB and as much as 75 dB for the most susceptible receiver. Clearly, both median and 90th percentile results for these three tests are in line with the 69 dB "just perceptible" results for the Magnavox receiver used in the CTC tests.

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LMCC also criticizes the use of an undesired signal located at a frequency near the visual carrier, because this "single data point" represents "the maximum susceptibility of the receiver." (LMCC A-6) In the first place, review of the TAC Final Report will show that broadcaster recommendations were decidedly not based on a "single data point." Further, refinements in receiver technology can be expected to increase the zone of maximum cochannel sensitivity. These improvements will widen the luminance bandwidth to a range from just below visual carrier to approximately 4 MHz above visual carrier. Such receivers will be increasingly sensitive to interference throughout the band, making it appropriate to extend the "worst-case" protection ratio near visual carrier throughout the entire bandwidth, extending for more than 4 MHz.

An antenna discrimination factor and other adjustment factors necessary to transform the D/U ratio required at the receiver terminals to a ratio of field strengths are discussed in later paragraphs.

LMCC supports a first-adjacent-channel D/U ratio of 0 dB. Support for the protection ratios set forth in the MST Comments is supplied therein and need not be repeated here. Interestingly, however, without providing further explanation, "LMCC does not propose land mobile operations in the same area on portions of the first adjacent TV channel." (paragraph 22) Quite obviously, LMCC is not comfortable with a 0 dB ratio for the entire first-adjacent channel.

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For those frequencies other than cochannel, Motorola now alleges that multiple interference test data acquired at CTJC should be adjusted by a factor of 8 dB because the multiple interferors were spaced at 15 kHz (Motorola A3-2). The 15 kHz spacing between multiple interferors was selected and agreed to by land mobile as well as broadcast and receiver manufacturer representatives in Working Group 1 of the Technical Advisory Committee (TAC). The logic behind selection of 15 kHz was that, even though some other carrier spacing might be selected, the frequency-modulated land mobile systems would swing through that spacing. Particularly in consideration of the fact that, in a land mobile context, simultaneous interferors are likely to exceed two frequently. Consequently, the 15 kHz differential in frequency is to be expected on a regular basis. Use of that spacing is appropriate.

Motorola makes reference to "measurements made on TV sets in our laboratory" without providing specific data to support its conclusions relative to those measurements (A4-2). Working Group 1 of the TAC was organized specifically to review available data from the work of others and to conduct whatever tests appeared to be desirable to supplement those data. Information relative to previous studies and additional tests was made available to all parties. Observers were welcomed to the NAB and CTJC laboratories for the observation of the

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tests, and the participants jointly agreed to test procedures. Motorola was an active participant in the Working Group. At no time was the Working Group advised that Motorola had available pertinent data. Now, to support its position, Motorola claims to have pertinent test data but, so far, has not been willing to offer it for scrutiny by the parties.

Tests at CBS Technology Center

Both LMCC and Motorola refused to make any findings based upon the subjective picture quality assessments made at the CBS Technology Center (CTC) on the grounds that they are inconclusive and contain internal inconsistencies rendering their results suspect. However, their attacks upon the CTC tests are based principally upon analysis of the test results from the 12 nonexpert viewers only and their preconceived beliefs that expert viewers are always more critical of picture quality than nonexpert viewers. Both of these positions are untenable.

It is certainly unfair to characterize these tests as a "minimum effort." (Motorola at 26). A review of program expenses shows that 15 people were employed over a period of five months. There were over 400 hours of software engineering alone put into this effort. Electrical engineers spent more than 200 hours and two experimental psychologists spent more than 1000 hours, this excludes the time of 18 observers, a technician, travel, a draftsman, overhead, etc.

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Motorola also criticizes the CTC tests as lacking "professional creditability." (Motorola at 26). The CTC tests were designed and conducted under the guidance of Bronwen Jones, a psychophysicist with nine years experience at CTC. Ms. Jones is vice-chair of The CCIR Interim Working Group 11/4, investigating subjective picture quality, and has published 15 or more papers on speech and hearing science and test methodology in professional journals. Her credentials as an expert in this field are not subject to question.

All members of the Working Group participated in preparation of the test protocol. Suggestions from broadcasting, land mobile, and FCC representatives were incorporated in the final test procedure. Land mobile representatives played an active role in designing the test procedures, writing the instructions read to the subjects, setting up the equipment, and approving the viewing conditions. In establishing the test design, Ms. Jones advised the Working Group that no fewer than 15 subjects were needed to provide results with a high degree of reliability. A division of two-thirds nonexpert and one-third expert subjects was agreed upon along with the total of 18. When the results of the testing were first presented to the Working Group, the point was made that only the total for all subjects should be employed and no reliability should be placed upon results from nonexpert-only or expert-only viewers.

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Both Motorola (at 26) and LMCC (at A-17) argue that the CTC tests were flawed because they used a single television receiver. This argument demonstrates a failure to recognize the objectives of the test. Only picture quality relative to the ratio of desired-to-undesired signals for linear and nonlinear interference mechanisms was being tested. CTC and the entire Working Group agreed that multiple receivers were not necessary. The CTC tests on the single receiver provided a "calibration factor" to permit the conversion of "just perceptible" interference in a 50 IRE flat gray scale display to an interference level "acceptable for day-to-day viewing." The laboratory work at the FCC, CTJC and NAB would provide the threshold numbers required for a variety of television receivers.

Motorola contends that TASO used "78 TV sets from 16 manufacturers" (at 26). On the contrary, each observer drew all conclusions from observing the same receiver. Four receivers were used simultaneously but only so that four groups of five observers each could be making observations simultaneously (TASO pp. 452 & 453).

LMCC (A-22) also contends that the results must be invalid because they do not show experts to be more critical in their judgments of picture quality. Expert viewers may be more critical than nonexpert viewers in

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identifying the onset of picture impairments, but experts are not consistently more critical than nonexperts when judging picture quality. Indeed, even the TASO results do not support the preconceived notions of the land mobile commentators.

TASO survey teams conducted approximately 1100 interviews in homes where the householder and the two or more engineers conducting the survey made separate judgments as to picture quality (TASO, page 204). The average difference between the householder and engineer opinions was .43 on a six-point scale, but considering both positive and negative differences, the average for the engineers' opinion was only .13 lower than that of the householder (TASO, page 205). Since no analysis has been made of the standard deviation, the .13 difference is not known to be significant. In any event, the difference is indeed minor. In consideration of the fact that the median differences between picture grades ran about 6 dB in the TASO tests, a difference of .13 would be less than one decibel. If any tests could be expected to support this expert/nonexpert hypothesis, it would be tests of the TASO era, when the engineers were accustomed to studio monitor pictures while nonexperts, used to poor-quality receiver displays, would be easily impressed. Indeed, many of the TASO nonexperts had never before seen a color television set. In contrast, today's viewers would be expected to be more sophisticated and show even less tendency to rate picture quality differently from the experts than was the case 30 years ago. The CTC tests confirm this expectation.

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Only two aspects of the testing at CBS appear to have any degree of anomaly. In the nonlinear interference tests, with results shown in Table 3 of the CTC 30 April 1986 report, the ratio scale for no interference was 5.5 less than with some interfering signal present. The explanation of the seeming anomaly appears to be the generation of a second harmonic signal in the preamplifier section of the receiver resulting in an impact upon the signal-to-noise ratio. The presence of an additional signal at the particular frequency involving the one-half IF interference phenomenon appears to actually improve the signal-to-noise ratio until the level of interference starts to become perceptible. The same phenomenon does not occur with other types of interference input. The progression of the ratio scaling with increased interference does not show anomalies and appears very reasonable. The ratio scaling results show that magnitudes of improvement or degradation with particular differences in D/U ratio can be derived. For instance, a 10 dB difference in D/U ratio can be seen to make about a 2:1 difference in the quality for the cochannel luminance test and about a 3:1 difference for cochannel chrominance. For the nonlinear case, a 10 dB differential in D/U ratio results in a picture quality difference of something in the order of 4:1.

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Land mobile interests also criticize the ratio scaling results because the nonexperts rated the "RF off" picture at less than 100, or below acceptable. It must be remembered that this was not a "clean" signal, but one with noticeable noise. The fact that viewers were slightly dissatisfied with such a picture does not call into question the test results, but simply shows that viewers have become more demanding. These results are consistent with Canadian DOC studies in 1983, showing that a 40 dB signal-to-noise ratio was "slightly annoying."

The other anomaly would appear to be the absence of a difference in picture quality with a 10 dB difference in desired signal input. That would appear to be a characteristic of the automatic gain control (AGC) circuit of the receiver. Approximately equal signal-to-noise ratio is being maintained with changing signal input. In the CTC tests, that factor was not significant for the judging of relative picture quality.

The reliability of the CTC testing was emphasized by the satisfactory standard deviations obtained in the statistical analysis of the test results. The only area where the standard deviations are so high as to cast doubt on the usefulness of the data is in the category of the "not usable" picture. Such a result is not surprising. Considerable variation is to be expected among viewers as to what is to be considered not usable. But the "not

usable" factor was never intended to be used in deriving the recommended planning factors. The only categories employed for determining appropriate D/U ratios for land mobile sharing were the "just perceptible" interference in a 50 IRE flat gray field or in program material, and the "acceptable" level of interference in program material. Unlike the "unusable" results, these figures have reasonably low standard deviations, and, thus, confidence can be placed on these results.

Picture Quality Adjustment Factors

Land mobile interests would apply a 20 dB correction factor for conversion from the 50 IRE flat field tests conducted in the laboratory to interference acceptable in program content (LMCC A-15; Motorola A3-3). The issue has been confused somewhat by frequent references to "passable" in place of "acceptable." In connection with the development of criteria for the subjective testing at CTC, the TAC Working Group 1, with no dissent from land mobile members, concluded that the end point should be an interference level "acceptable for day-to-day viewing." Although "passable" had been employed by TASO and often by the FCC, Working Group 1 agreed that the term did not lend itself to a clear definition of the test objective. In the ordinary meaning of the words, "acceptable for day-to-day viewing" appeared to be quite understandable. The same characterization cannot be applied to "passable." The difficulty with this